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NRL 5524

PURCHASE DESCRIPTION

ANALYZER, SPECTRUM

4338-J

1. 0 **GENERAL** This procurement requires a portable spectrum analyzer, which operates over the frequency range of 10 kHz to 40 GHz with microwave preselection to at least 26.5 GHz. The equipment shall include synthesized tuning and a built in frequency counter. It shall, also, be capable of marker-aided relative and absolute frequency and amplitude measurements of RF and microwave signals, digital data storage, and with IEEE Std 488-1978 digital bus control.

2.0 **CLASSIFICATION** The equipment shall meet the requirements of MIL-PRF-28800( ), class 3, for Navy shipboard, submarine and shore applications, with the following exceptions:

a. The non-operating temperature requirement is limited to the range of -20°C to +70°C.

b. The warm up time is extended to one hour.

c. The digital readout shall be designed for use at arms length.

d. A tilt-bail handle shall be provided.

3.0 **MEASUREMENT REQUIREMENTS** The equipment shall be capable of spectrum analysis within the following minimum specifications. When specified, N is the number of the harmonic component of the synthesized local oscillator.

3.1 Frequency Specifications

3.1.1 Range: 10 kHz to 40 GHz.

3.1.1.1 Preselected: At least below 26.5 GHz.
3.1.1.2 External mixers: In the range of 26.5 Ghz to 40 Ghz external mixers are acceptable.

3.1.2 Frequency accuracy: ±[5% of span + 15% of resolution bandwidth + 50 Hz + (center frequency X 10^{-7})].

3.1.3 Frequency stability: 50 Hz X N drift per minute of sweep time for spans of 100 kHz or less.

3.1.4 Frequency readout resolution: 1% or less of selected span or 1 kHz, whichever is greater.

3.1.5 Delta frequency range: A mode of operation shall be provided wherein the frequency readout indicates the frequency difference of two independently variable markers.

3.1.5.1 Delta frequency readout resolution: 1% of span.
3.1.5.2 Delta frequency accuracy: 1% of span.

3.1.6 Center frequency tuning resolution: 0.1 divisions or less of the selected span or 200 Hz, whichever is greater.

3.1.7 Signal counter: The equipment shall be capable of counting signals within the frequency range specified in 3.1.1. Accuracy of indication: ±[(marker frequency x reference frequency error) + (50 Hz x N) + 1 LSD]. Reference frequency error: 1 x 10 E-7 or less.

3.1.7.1 Signal counter resolution: Selectable from at least 1 Hz to 1 kHz.

3.2 Span Modes A mode shall be provided wherein the full specified frequency range for each band is displayed. A mode shall be provided wherein the CRT horizontal axis is calibrated in time instead of frequency. A method for selecting spans shall be provided wherein the total span of the horizontal graticule area shall be selectable from 100 Hz to 1 GHz typically with seven ranges in a 1,2,5 sequence.

3.2.1 Span to resolution bandwidth ratio: The selecting of the total span and resolution bandwidth shall be such that a total span to resolution bandwidth ratio of 10:1 is achievable for any span setting up to 20 MHz. This may be accomplished by manual or automatic means.

3.2.2 Span accuracy: ±5% of the selected span over the center 80% of the graticule area.

3.3 Residual FM 5 Hz x N peak-to-peak maximum in 20 ms for zero span.

3.4 Resolution Bandwidth Selectable from at least 10 Hz to 2 MHz.

3.4.1 Resolution bandwidth accuracy: ±20% of the selected bandwidth. The 1 MHz bandwidth shall be within ±25% and the 100 Hz or less bandwidths shall be within ±30%.

3.4.2 Shape factor: 5:1 or more at the 3 dB and 60 dB points.

3.4.3 Video filter: Selectable band-stop filters shall be provided within a frequency range of 3 Hz or less to at least 30 kHz.

3.5 Input Specifications

3.5.1 Input impedance: 50 ohms nominal. With 10 dB or more input attenuation selected, the VSWR shall not exceed 2.3:1 for frequencies to at least 26.5 GHz.

3.5.2 Maximum input: 30 dBm continuous and 75W peak for 1 μs when using Type N connectors with 20 dB or more attenuation selected. The maximum input for waveguide: 15 dBm continuous.

3.6 Display Dynamic Range 80 dB at 10 dB/div, 16 dB at 2 dB/div, and eight divisions in the linear mode.

3.6.1 Display accuracy: ±2 dB at 10 dB/div, ±1.5 dB at 2 dB/div, and ±5% in the linear mode.

3.6.2 Display flatness: When measured with 10 dB of selected input attenuation and referenced to the internal calibrator frequency, the displayed flatness shall be ±2 dB for frequencies to at least 26.5 GHz.

3.7 Spurious Response Specifications

3.7.1 Residual: Spurious response: -90 dBm with no input signal applied from 200 kHz to 6.46 GHz. The response shall degrade to no worse than -70 dBm at 26.5 GHz.

3.7.2 Distortion: Spurious harmonic distortion shall be at least 60 dB below the carrier for a signal input mixer level of -40 dBm or less up to 26.5 GHz. Third-order intermodulation products shall be at least 70 dB below the carrier for a signal input mixer level of -30 dBm or less.

3.8 Input Noise Sensitivity -90 dBm or less when a 100 Hz resolution bandwidth and 0 dB attenuation are selected.

3.9 Noise Sidebands The noise sidebands shall be at least -100 + 20 Log N dBc/Hz at offsets from the carrier of 30 x resolution bandwidth with resolution bandwidths of 1 kHz or greater.

3.10 Vertical Display Modes Log 10 dB/div, Log 2 dB/div, and Linear V.

3.10.1 Input attenuator range: 0 dB to 60 dB in 10 dB steps. Attenuator accuracy: ±1.8 dB per 10 dB steps to a maximum of ±3.5 dB.

3.10.2 Reference level range: -95 dBm to 30 dBm for log modes and 3.9 uV to 7V in the linear mode. The reference level shall be adjustable in increments of 0.25 dB or less for the log mode and to one division or less in the linear mode.

3.10.3 IF gain variation: ±1 dB maximum for any 10 dB change in the reference level between 0 and -80 dBm.

3.11 Sweep time: Selectable from 20 μs/div to 1 s/div in zero span mode. Manual and auto sweep modes shall be provided.

3.11.1 Accuracy: ±20% of setting.

3.12 Trigger Internal, external, free run, and single sweep triggering modes shall be provided.

3.13 Digital Storage Digital storage shall be provided with selectable modes that compare and subtract two signals, and save maximum signal values and noise-average spectral displays. The digital storage function shall be capable of storing and displaying at least eight spectrums including the readout measurement parameters.

3.14 Markers The equipment shall provide frequency and amplitude markers using one marker for absolute measurements and two markers for relative measurements. Marker positioning will provide a readout of frequency and amplitude of any point, or the difference in amplitude or frequency between two points, along a displayed spectrum.

3.15 Display Specifications A display with an internal graticule of at least 8 x 10 divisions shall be provided. The display shall provide a readout of center frequency, span or span/div, resolution bandwidth, vertical scale factor, reference level, marker readout of frequency and amplitude, video filter selection, and RF attenuation. The display area shall be at least 6.5 cm (2.6 in) high by 7.5 cm (3 in) wide.

3.16 Outputs Outputs for simultaneously interfacing a tracking generator and mixer shall be provided. Outputs for a digital plotter shall also be provided.

3.17 Reference Input Frequency: 10 MHz. Amplitude: at least 0.35 vrms

3.18 Internal Preselection Internal preselection shall be provided to at least 26.5 GHz.

4. 0 GENERAL REQUIREMENTS

4.1 Power Source MIL-PRF-28800( ) nominal power source requirements are invoked. Maximum power consumption: 250W.

4.2 Lithium Batteries Per MIL-PRF-28800( ), lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

4.3 Weight 20 kg (44 lb) maximum excluding accessories.

4.4 Calibration interval The calibration interval shall be 12 months minimum as in accordance with MIL-PRF-28880F.

4.5 Digital Interface The digital interface shall conform to ANSI/IEEE-STD-488.

4.6 Technical Manual The vendor shall provide a technical manual for the equipment in both printed and electronic formats. The printed format shall be as otherwise normally provided. The technical manual in electronic format shall be readable through use of the Adobe® Acrobat® reader application. The electronic format shall consist of the installation programs for the latest version of Adobe® Acrobat® reader for all computer platforms for which Acrobat® is available.

4.7 Training: A CD-ROM showing the features and basic operation of the spectrum analyzer shall be provided.